ABSTRACT

A method of optical characterization of materials without using a model. To characterize a layer of material over an interval A of values taken by a function $\alpha(\lambda)$ (λ: wavelength), the method (1) obtains, via reflectometry and/or ellipsometry over A, a measured spectrum ψ, (2) chooses m values $\alpha_1 \ldots \alpha_m$ of α in A ($m \geq 1$), with $B=\{\alpha$ such that $\min(\alpha_i) \leq \alpha \leq \max(\alpha_i)\}$ when $m>1$, and $B=A$ when $m=1$, (3) chooses m values of complex indexes $n+jk$ for the $m\alpha_i$, (4) if $m \neq 1$ calculates via interpolation the index $n(\alpha)$ over B, from $(\alpha_i, n_i=n(\alpha_i))$, $1 \leq i \leq m$, and if $m=1$, $n(\alpha)=n_i(\alpha_i)$ over B, (5) chooses M parameters, $M \leq 2m+1$, and an error function Er and, via a minimizing of Er with M parameters, (a) applies interpolation law of the (α_i, n_i) over B, deduces $n(\alpha)$, $\alpha \in B$, (b) using $n(\alpha)$ and the thickness ϵ of the layer, calculates a theoretical spectrum $\overline{\psi}$ $(n(\alpha),\epsilon)$, (c) compares ψ and $\overline{\psi}$ using Er and, if $Er(\psi, \overline{\psi}) \leq e$ or minimal, goes to (e), if not (d) makes the M parameters vary to approach the minimum of $Er(\psi, \overline{\psi})$, and goes to (a), (e) if $Er(\psi, \overline{\psi}) < e$, sets the index equal to the last one obtained, otherwise increases m and goes to (2).